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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/743,545	03/01/2001	Thomas Jung	65243-001	2852

7590 10/04/2002

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EXAMINER	
PADGETT, MARIANNE L	
ART UNIT	PAPER NUMBER
1762	

DATE MAILED: 10/04/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
09/743,585	Thomas Jung
Examiner	**Group Art Unit**
M.L. Pelgett	1762

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

☒ Responsive to communication(s) filed on 3/1/01

☐ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle,* 1935 C.D. 1 1; 453 O.G. 213.

Disposition of Claims

☒ Claim(s) 1-19 is/are pending in the application.

Of the above claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-19 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claim(s) _____ are subject to restriction or election requirement

Application Papers

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)–(d)

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)–(d).

☒ All ☐ Some* ☐ None of the:

☐ Certified copies of the priority documents have been received.

☐ Certified copies of the priority documents have been received in Application No. _____ .

☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a))

*Certified copies not received: _____ .

Attachment(s)

☒ Information Disclosure Statement(s), PTO–1449, Paper No(s). 4

☐ Interview Summary, PTO–413

☒ Notice of Reference(s) Cited, PTO–892

☐ Notice of Informal Patent Application, PTO–152

☐ Notice of Draftsperson's Patent Drawing Review, PTO–948

☐ Other _____

Office Action Summary

1. Claims 1-19 are objected to or rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Since "objects" is first introduced in line 1 of claim 1, its latter use in line 4 without an article showing antecedent basis, nor clear differentiation, is objected to. In lines 5-6 "the inner wall" is objected to for lack of antecedent basis, noting that it is further unclear exactly what is "at a distance from the inner wall", as well as what exactly the inner wall is part of.

It is also uncertain why applicant's claim "the plasma generated by the glow discharge" (last line), since the latter is generally a description of the type of plasma. In other words, the term "glow discharge" describes features of the plasma. It does not cause it, but is part of it. Also, besides this confusing statement, "a plasma" from line 2 and "glow discharge" from line 8, have been introduced separately, with no clearer connection, but the suggestion or implication that they are two separate things. Is applicant trying to claim the presence of two different plasmas, one initiated by other, or is this just a poor translation or poor phrasing?

While is not officially incorrect to include reference numbers in the claims, it can sometimes cause confusion as to how much those numbers are intended to modify or define the claims, i.e. is the specific configuration shown intended as part of the limitation in the claim or not?

As claim 1 says that the glow discharge generates the plasma, it is unclear how the requirements of claim 2 (AC or DC electrode generates plasma) or claim 3 (microwaves generate plasma) relate to the previous limitations of claim 1.

In claim 6, "a target" for what? Is this an attempt to say the wall or the box supplies deposition meterial for the objects? It is unclear. Also, "is formed of a coating material" is

ambiguous. Does this mean that the wall or box has been coated, or that is a source of material for coating?

In claim 8, what meaning does "clear" give to "clear width of the box structure"? How does it relate to width, length and/or height? Also, how does one determine what parts of the space are considered available and unavailable? If an object is hollow, does the volume enclosed count as filled or unfilled?

In claim 9 "the withdrawal opening" lacks any antecedent basis (due to inconsistent terminology), and the meaning of "the sum of the larger of the other openings (3, 6, 6')..." has unclear meaning and lacks proper antecedence. What exactly is being added to make the value of the sum? The area or circumference of only some of the other openings, of which there are 3 or more? Does one only not add in the very smallest opening "size", or the 2 smallest, as what?

Use of relative terms that lack clear metes and bounds in the claims, or in the specification, or cited relevant prior art, is vague and indefinite. In claim 11, line 3, see "sufficiently low" describing "pressure". What value does this represent, and sufficiently low for what purposes?

Since method claim 11, depends from claim 1 "an operating gas" and "a plasma" in line 3 are objected to for using the wrong article for previously introduced limitations, and "the plasma power" (line 4) is objected to as lacking proper antecedent basis, as does "the surfaces in line 1. Note that since the claimed coating is through stripping material from the inner wall, it is considered to mean sputter coating, but that since surface modification is inclusive of coating, other coating techniques may read on modification.

In claim 12, it is unclear where "an ion-supported desorption of deposited adsorbate layers" is taking place. Are these layers what is being referred to when "material stripping" is

recited in claim 11? Or is applicant referring to layers else where, such as contaminates to be cleaned off the objects?

It is uncertain how the solid powder deposited in claim 14, relates to the "modification of the surface and/or...coating [through material stripping]" of claim 11, from which it depends. Is this a totally separate step, or is it a more detailed description of the previously claimed process step?

Note with respect to claim 13, that the (sputter) coating claimed in the preceding claim 11 is only one option, not necessarily chosen, i.e. not positively taking place even in claim 13 (,but if there is sputter coating then reactive gas would be required in 13).

In claims 15 and 17 "the potential difference" lacks proper antecedent basis. It is noted that claim 16 ends in an acronym in brackets, "[STP]". In US patent claims, this has always meant that the term(s) within is to be deleted, however as this is present in the original claim, the examiner suspects that deletion was not intended. Also note that in first usage in claims, acronyms should be written out in full. Does STP stand for --standard temperature and pressure-- in this case?

In claim 17, is the intent that the pressure introduced in line 3 of claim 11, i.e. that present after evacuation, is what is increased threefold, to thus provide a higher operating pressure for surface modification? Note, that a 3 fold increase in a relative term, is still relative, and that the parameters of claim 17 do not necessitate any particular effect.

In claim 19, it is unknown what an "inner gas" might be, but the examiner suspects it is a typographical error for --inert gas--. Also, in line 3, "the working gas" lacks any antecedent basis, hence is vague and indefinite, however as the term "operating gas" was used in claims 1 and 11, this may be another case of inconsistent terminology, but at present there is no clear relationship established between these differently described gases.

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-2, 4-7, 10-12 and 18-19 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by E. Kay.

Claims 8-9, 15-16 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over E. Kay.

Kay teaches a cylinder and hollow cathode sputtering apparatus, where the cathode (40) its self forms the chamber, and may also be the sputtering source material. Alternatively, a sleeve (inner-wall coating or cover) may supply the deposition material. The anode (42) is suspended in the middle of the cathode chamber, and may either be the substrate (47) (object to be treated/coated) or may hold it. The cathode is cooled, as exemplified by cooling coils 50. Removable to (71) provides a sealable access port for inserting the substrate(s), with gas inputs (inert) provided by ports (57, 57^1), and evacuation by port (52). The glow discharge plasma discussed by Kay are energized by DC sources. See Figures 3-4; col. 1, lines 10-17; col. 2, lines 3-7; col. 3, lines 24-26; col. 7, lines 19-40 and col. 9, lines 15-20^+. Specific teachings of use for metal compounds, alloys and particular metals may be found on col. 11, lines 63-70 and col. 13, lines 3-17. Pre-cleaning of the chamber (i.e. removal of any materials absorbed on

chamber surfaces) via ion bombardment is discussed in col. 8, lines 40-59, while lines 60-73 teach cleaning of the substrates by ion bombardment in an attached auxiliary chamber 70.

Note that with respect to claim 19, while "inner gas" has no clear meaning, so that any gas may be considered to read on it, the taught inert gas (col. 9, line 16) would cover it. Alternatively, if "inner" should be --inert--, the meaning is explicitly read on. Claim 19 is included as both 102 and 103 due to the uncertainty.

Kay does not teach dimensions or percentages as claimed by applicant (claims 8 or 9), however one of ordinary skill in the art would view the figures, such as 3 or 4, etc., for determining relative proportions of the taught structures, and would have been expected to use values consistent with these claimed, especially given the uncertainties (discussed in section 1) of these values or how they are determined/calculated.

Kay does not give the potential differences in volts, but in eV (electron volts), which are not the same thing, and discusses that between cathode and anode of 2KeV (col. 10, line 1-5) would be expected to produce a related but lesser difference between the intervening plasma and the cathode, and variations would have been expected depending on other parameters and structural variation in the chamber.

While no particular gas flow ranges were taught, variable amounts and continuous flow as discussed in 9, and it would have been obvious to determine optional flows for particular depositions and desired results, given the basic gas input teachings.

It is also noted that "box structure" does not require any particular shape, except that it create a hollow structure which encloses space, i.e. boxes maybe cylindrical or complex cylindrical shapes, etc, as in Kay.

4. Claims 1-2, 4-7, 10-12 and 18-19 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Wright et al.

Claims 8-9 & 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wright et al

Wright et al has teachings analogous to Kay for the purposes of the rejection, except that the hollow cathode structure reads on the alternative option of a structure that is put in a vacuum chamber, rather than being the chamber (see Fig.2, discussed on col.3, lines 3-60). Note use of inert gas, back filled into the evacuation chamber, and possible continuous flow in the chamber where a partial vacuum remains (col. 2, lines 44-48 and col. 3, lines 61-68). While how much the pressure increases when the chamber is filled is not discussed, it would have been obvious to one of ordinary skill in the art to determine optimum operating pressure, and that the degree of increase depend also on the original degree of evacuation, which will in turn be dependent on pump capabilities and how sensitive the desired coating is to impurities from residual air contamination. Teachings of sputter cleaning the substrates via application of bias can be found in col. 4, lines 1-6 and 59-68; metal coatings from the material sputtered from the cathodes (including the hollow cathode walls) are discussed on col. 3, lines 8-11 & col. 4, lines 7-37; use of DC or RF (i.e. AC) potential to energize the plasma is found in col. 4, lines 50-58, with potential of negative 500-2000 volts (DC) or 500-5000 v for RF. As the anode is supplied with DC potential of + 30 to 50 volts, potential difference between anode and cathodes include ranges as claimed for the between the plasma and cathode. Given the close relationship between these potential differences, one of ordinary skill in the art would have expected the plasma-cathode potential difference also to be similar. Routine experimental determination of flow rates would have been obvious as discussed above in section 3.

5. While the PCT search report cites the abstract to the Tateishi Hideki Japanese patent as reading on claims 1, 6 and 10 as an X reference, the extremely poor quarterly of the computer translation, makes actual meanings uncertain. A proper translation has bee ordered.

The US patent to Henshaw (abstract, figures, esp. 3; summary and col. 2, line 340col. 3, line 15) is equivalent to Kay or particularly Wright et al, for showing use of a cathode enclosure as a target (source material) in glow discharge plasma sputtering, but does not discuss substrate placement. Henshaw is also noted to teach an alternate shape for the cathode enclosure, that of a rectangular box, rather than the cylindrical ones of Kay or Wright et al.

6. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kay or Wright et al as applied to claims 1-2, 4-12 and 15-19 as appropriate above, and further in view of Boehnke et al.

Neither Kay nor Wright et al discusses use of powder as a deposition source material, however Boehnke et al shows that powder may be used to form target materials on supporting dishes (i.e. containers) for use in cathode sputtering (abstract; Figures esp. 1; col. 1, lines 5-8 and 32- col. 2, line 3 and lines 37-50; and col. 3, line 10- col. 4, line 3). The powders employed may be oxides or metal powders, where it is noted that when staring with a metallic target material, cathode sputtering may be done in the presence of a reactive gas in order to deposit metal oxide layers. It would have been obvious to one of ordinary skill in the art to use powder targets and/or gases as taught by Boehnke et al in either Kay or Wright et al, because of the advantages of powder targets taught in Boehnke et al, i.e. their inexpensive manufacture, short evacuation times and rapid sputtering rate (col. 1, line 55-62), especially as either Kay or Wright et al may use coated layers as target structures in their process and Boehnke et al also is consistent with the cooling teachings of the primary references (col. 2, lines 64-66) and shows the desirability of metal oxide deposits as well as metallic deposits.

7. Note Boehnke et al is also consistent with Henshaw as the panels used to form the cathode enclosure therein, are consistent with powder targets held in support dishes.

Shinmi et al is cited as of interest for having further teachings on use of powder targets for sputtering or reactive sputtering (see col. 6 and 8).

8. Claims 3 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wright et al as applied to claims 1-2, 4-12 and 15-19 as appropriate above, and further in view of Kügler.

Neither Kay or Wright et al discuss use of reactive gases, nor use of microwaves, however both recognize use of DC for sputtering. Kügler discusses problems, such as target poisoning encountered when reactive gases are used in such process (col. 1, lines 20-62), but finds that when RF or AC current is superimposed on the DC that reactive sputtering may be effectively and efficiently carried out (Abstract; figures; col. 1, line 63-col. 2, line 25 +; col. 3, line 54-col. 5. line 50), hence it would have been obvious to one of ordinary skill in the art to employ techniques as discussed in Kügler to the DC processing of Kay or Wright et al inorder to enable deposition of dielectric materials from conductive targets through reactive sputtering, as Kügler shows the desirability of such deposits, and provides the means to modify the sputtering apparatus of the primary references to avoid the discussed prior art problems. While AC of 50 Hz to 250 KHz were found to be effective frequencies, other suitable frequencies when the AC was generated as impulses were found to include up into the microwave range, hence any of these frequencies, such as microwaves, would have been expected to have been effective applied in this combination.

9. Other art of interest includes Scherer et al (abstract; col.1, line 62-col. 2. line 54), or Latz et al who also have discussions of reactive sputtering and microwave glow discharge. Dugdale has further teachings of reactive gases used in cathode sputtering in enclosures.

10. Any inquiry concerning this communication should be directed to M. L. Padgett at telephone number (703) 308-2336 on M-F from about 8 am- 4:30 pm; and FAX#(703) 872-9310 (regular); 872-9311 (after final); and 305-6078 (informal).

M.L. Padgett/dh
September 30, 2002
October 3, 2002

MARIANNE PADGETT
PRIMARY EXAMINER